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## Wire-free networking

Whether it's central to your small business or necessary for your home entertainment setup, you've almost certainly got a mass of wires trailing across the floor from your PC to all the other electronic gizmos you've hooked it up to. Simon Williams shows you how to set your PC free with a wireless network

**W**ith the proliferation of PCs and peripherals in our offices and homes, more and more of us are connecting our hardware together. And while it's easy enough to hook up a PC to a printer, scanner and so on, or to link two PCs together into a modest network, by the time you've made all these connections the back of your machine looks like a pit of vipers. Those cables are ugly, awkward to hide and, above all, unnecessary.

In an office, networking is the norm. However, it's an expensive business and even quite small movements of staff or departments can mean major costly

restructuring of the cables connecting all these PCs. So a wireless network has obvious advantages; even cost, a bugbear in the early days, is less of a barrier now. Eschewing cables in favour of low-power radio waves, a wireless network can provide communication between PCs and any piece of hardware you might need on a conventional, cabled network. Suddenly you're free to move desks around, wander with your notebook or PDA and still send a document to the printer next to your desk.

In the following pages we explain how wireless networking works and show you how to set up your own cable-free network.

ILLUSTRATION: AILEEN O'DONNELL

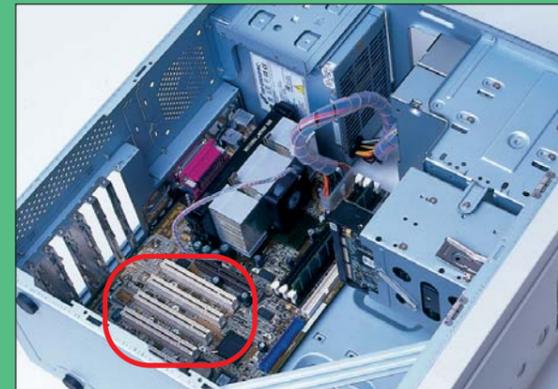
### Fitting wireless network cards for a peer-to-peer network

**S**etting up a wireless peer-to-peer network, where PCs are simply linked to each other, is a lot easier than a cabled one. However, you still need to open each desktop PC and insert a suitable network card. This isn't difficult, but there are a couple of safety precautions it's wise to take.

Although new PC Cards are much less sensitive to static electricity than they once were, it's best to leave each computer connected to the mains but switched off at the

wall. This ensures it remains earthed as you work on it. It's also worth touching some point on the bare metal chassis before handling the network cards to earth yourself.

When handling the PCI adapter cards, try not to touch the gold-plated contacts along the bottom edge. Position a card with these contacts over the PCI slot and press down firmly, without forcing it. As for tools, you'll need a crosshead screwdriver – nothing more.



**1** Unscrew and remove the case for each PC that you wish to connect wirelessly. Do this by unscrewing the two or three screws at the back and removing the side panel or the top of the case. Pick a vacant PCI slot for each PC – these are normally the long white sockets

**2** Unscrew and remove the backplate to the PCI socket and press the wireless PC Card into place. Do this for each PC in the network, apart from the PC that you wish to use as the hub or will be connected to the server, depending on your setup. Replace the backplate screw and the PC case

### Fitting a wireless access point for an existing ethernet network

**I**n an existing office network, where PCs, printers and other common peripherals are shared via a server or central hub, the easiest way to add wireless components is to fit an access point, or base station. The best option is to connect the access point to your hub on the existing network.

When choosing a base station, make sure it supports the same wireless standard as your existing wireless components.



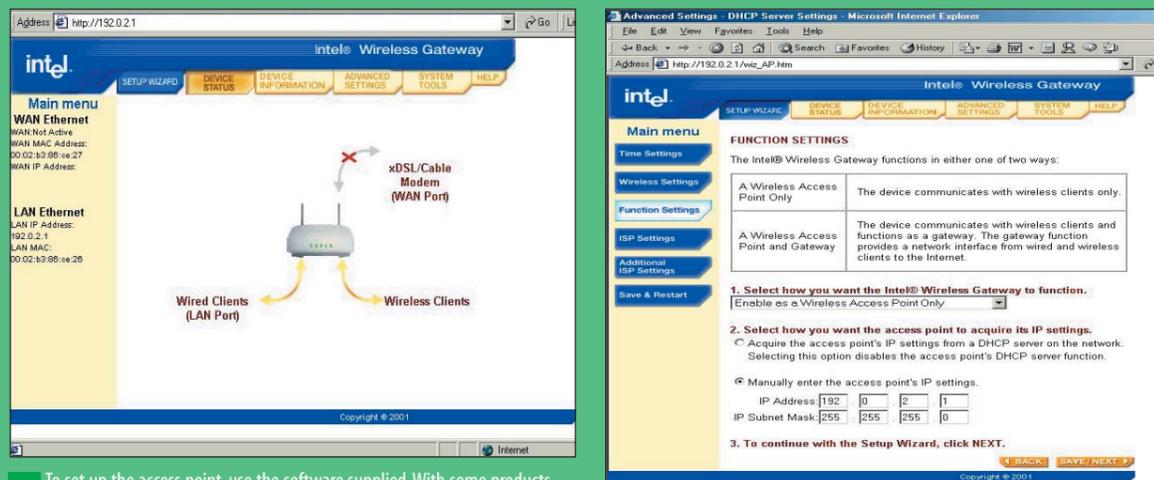
**1** In each PC which is to use the access point, fit a cabled network card instead of the wireless PC Card



**2** Attach each PC network card (left) to your hub (right) using the special 'crossed' network cable supplied. If you're connecting directly to a PC, you need a crossover cable. This ensures you connect to the right pins and the networked devices can communicate. Once you've connected the access point and hub, you go through the same setup process, but possibly with the additional installation of a gateway to a dialup or broadband modem, so you can use a shared connection

**3** Many wireless network access points have the facility of connecting to a router or terminal adapter, enabling anybody on your network to gain access to the internet across the wireless network

## Installing drivers and configuring the network

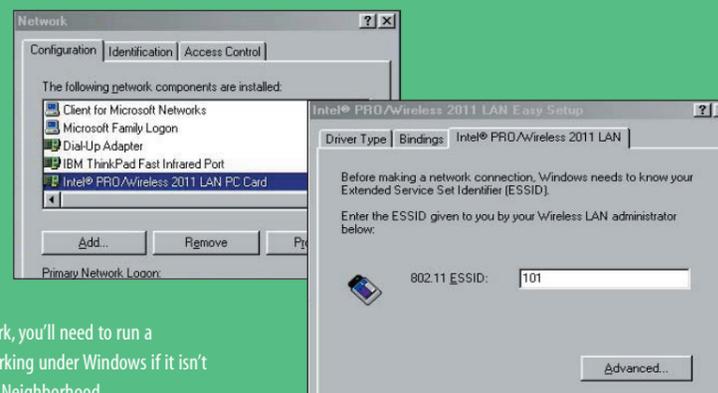


**1** To set up the access point, use the software supplied. With some products, such as Intel's, the software is built in to memory inside the access point and can be run using your web browser

**2** Enter the IP (internet protocol) address and subnet mask values for your network – this will vary depending on the make of access point and your particular requirements. In most cases you can use the default value provided in the access point documentation



**3** On each of the PCs that will be using the wireless network, you'll need to run a network driver for the wireless card and to set up networking under Windows if it isn't already enabled. You should then see the PCs in your Network Neighborhood



### What no wires?

Initially, going wireless seems pricier than a cabled network, but when you add in installation costs and the ease of repositioning a wirelessly-networked PC, it starts to balance out. A typical wireless network has a range of around 100m, though this will depend on the environment in which it's installed. You're much likely to get better reception in a large, open-plan office than in an old cottage with thick stone walls, but even then a typical wireless installation will have little trouble covering every area of a domestic workspace.

If you need to cover a wider area than this – perhaps from building to building on

an industrial or academic campus – consider booster aerials that can increase the working radius up to around 2.5km. An unobtrusive unit can easily be fitted high on a wall or on a ceiling and is little more noticeable than a smoke detector.

In its simplest form, each PC you wish to connect just needs to be fitted with a wireless networking card. With this, you can set up an ad hoc network that is ideal for multiplayer gaming and for other home uses. If you want to do things such as sharing an internet connection, you'd be better off fitting one of the PCs with a wireless 'access point'. This administers all the wireless traffic scudding through the ether.

Wireless facilities can also be added to an existing network, either as a direct extension of that cabled network or through a gateway. Wireless and cabled networks are thus linked together but with separate security. This is known as an infrastructure network and lets you combine your access point with a router, allowing you to share a fast internet link with everyone on your network.

In order to add notebooks to a wireless network, you must fit networking PC Cards to each device. It's slightly different if you're connecting desktop systems – you use the same type of PC Card, but with adapters which fit the PCI expansion slots in the PC's innards. Most base-level

## Adding a notebook or PDA to the network



**1** Fitting the wireless card to a notebook or PDA (personal digital assistant) is a lot easier than fitting it in a desktop PC. All you do is push the PC Card or CompactFlash adapter into the corresponding slot. Software installation is the same as for a desktop PC

**2** Install the driver software and set up Windows to use a network. Once it's working, you should be able to use all the resources of the network. Some wireless software includes utilities to test the strength of the wireless link. This is useful if you want to map out the radius of reception from your access point. The network speed drops off as you get further away

systems can accommodate between 64 and 256 PCs in a given network, but some systems let you network 'cells'. These communicate through gateways in a similar way to mobile phones working on different transmitter cells. With systems like this you can increase the total number of networked computers.

### Need for speed

Most wireless networks currently work at 11Mbps (megabits per second) – about the same speed as a 10BaseT cabled network – though 22Mbps versions are now being introduced. There's still no easy way of getting a wireless 100BaseT equivalent, though 54Mbps standards (802.11a and 802.11g) are already on the books.

The top speed of 11Mbps or 22Mbps depends on the distance between the wirelessly networked PCs. As they get further apart packets of data are missed and must be re-sent, so the transfer rate drops – in extreme cases, down to as low as 1Mbps. These quoted transfer rates are very much best-case figures

as on a conventional network, the number of PCs connected also affects the data throughput.

### Types of wireless network

The main protocol used to govern wireless networks is IEEE 802.11. This group of standards has four main variants: 802.11, 802.11a, 802.11b and 802.11g. Current wireless networks running at 11Mbps use 802.11b (also known as wi-fi), while the new 802.11a and 802.11g standards promise throughputs of up to 54Mbps but are typically limited to a range of 20-24Mbps.

The 802.11b standard transmits and receives in the 2.4GHz radio frequency range, which is also used by some wireless phones and by the Bluetooth protocol. On the other hand, 802.11a uses frequencies around 5GHz – a region which is not nearly as crowded. Basically, you can either opt for low-cost, low-throughput, long range and possible congestion with 802.11b or high-cost, high-throughput, short range and low congestion with 802.11a.

It's also possible that Bluetooth will become a vehicle for wireless networking. Although it's primarily intended for wireless communication between PCs and peripherals, it could be fast enough for connecting PCs peer-to-peer in a non-taxing environment such as the home. Its maximum transfer rate is around 1Mbps, though, so in its present form it's not capable of high volumes of network traffic.

### Cable-free costs

Wireless networking equipment is more expensive than the cabled equivalent. A typical wireless PC Card for an 802.11b network will cost between £70 and £100, with the PCI adapter (required in a desktop PC) adding another £40. Bare access points (also known as base stations) which connect your wireless network to your cabled network, start at around £140 and rise to £700-£800. Prices depend on the level of security required and whether you want to include a broadband router.

Cabled networking costs are much lower. A PCI networking card will cost around £15 and a PC Card for a notebook will be around £40. Hubs for connecting your PCs range from £35 for a five-port device to £100 or so for eight- or 12-port units. Cable costs will vary by length, but you should allow around 50p per metre.

Remember to factor in installation costs for the cabled network, such as cabling your working area and the possible repositioning of PCs. You will also have to open each PC to fit a network card, install the software and get the network up and running. You could easily be looking at a day's work by an electrician and another from a network consultant.

To install an equivalent wireless network, costs for fitting network cards, installing software and setting up the network would be similar, but without the cabling charges. Setup in this case would be around £400. When you add the two sets of costs together, you still have a win for the cabled alternative, but not by as much as the component costs might suggest. For the extra £200 or so you have the flexibility to move your PCs around with no rewiring costs. ■



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